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A STUDY OF THE SCALES OF SOME OF THE FISHES OF THE DOUGLAS LAKE REGION*

BY ARTHUR T. EVANS

During the summer of 1913 while in attendance at the University of Michigan Biological Station on Douglas Lake in Cheboygan County, Michigan, an effort was made to find out if possible whether the variation in the scales of different fishes is such that the scale characters are of any taxonomic value. The objects of the study were to determine, (1) whether there is a marked difference in the scales from different individuals of the same species; (2) whether the scales of an adult and a younger specimen of the same species varied sufficiently to be mistaken for scales of another species; and (3) to determine in just what way the scales of various families differ. As the length of time for conducting the work was limited only ten of the more abundant species were studied in detail.

The writer is indebted to Professor Max M. Ellis for help and suggestions in the course of the work.

Since the examination of all the scales of a number of fishes would be a big task and quite likely unnecessary it was decided to examine scales from what appeared to be the three most typical regions of the body of the fish. Before deciding upon these three typical regions an examination was made of the scales from various other parts of the body of the fish to determine just where the most variation occurred and of what this variation consisted. Throughout the course of the work whenever a fish of a different species was studied a complete examination was made of scales selected from various parts of the body to make sure that variation did not occur in parts not included in the typical bands. The three regions selected were, (1) just anterior to the dorsal fin (Band 1); (2) just anterior to the soft dorsal (Band 2); and (3) just anterior to the caudal fin. In each of these regions a band of scales was taken the entire distance around the body of the fish. Each scale was examined under the low power of the compound microscope and the following data recorded: (1) number of teeth, if any; (2) number of radii (this includes both entire radii and radii of which only parts were visible in Table 1); (3) number of basal lobes, (4) whether the circuli extended through the apical area or not, and (5) the form of the circuli.

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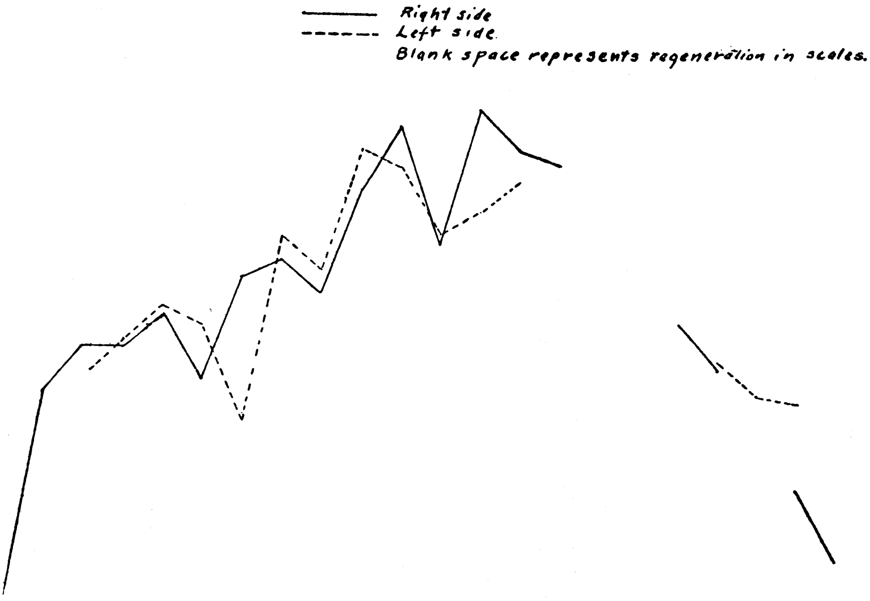
*Contributed from the University of Michigan Biological Station Number 16.

It was supposed that there might be a variation in the number of teeth, radii, and lobes correlated with the age of the individual so in order to find out the exact extent of such variation three different sizes of the several species of fish were examined whenever it was possible to obtain them. In selecting individuals for study it was assumed that the larger fish were the older.

Figure 1.



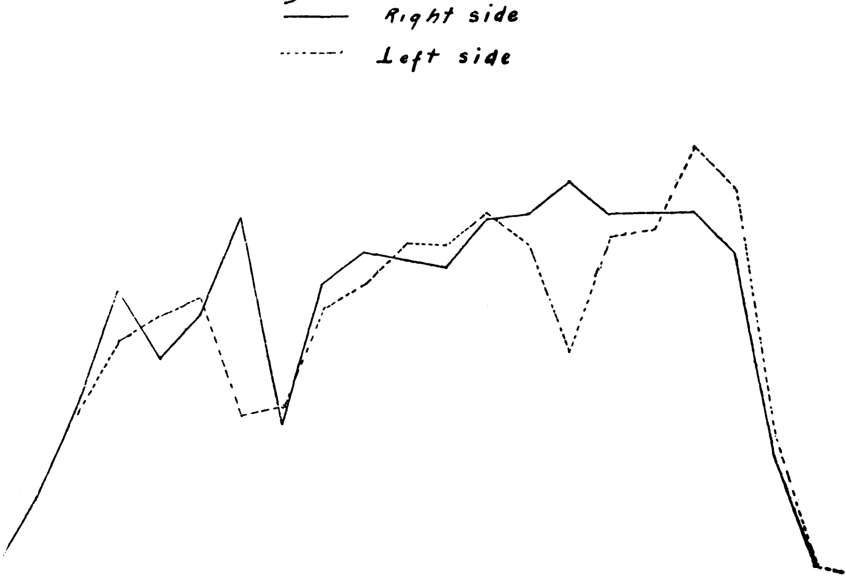
Perca flavescens (Mitchill)

The first fish selected for a detailed study was *Perca flavescens,* because of its abundance in Douglas Lake and the ease with which it might be obtained, since numbers of individuals might be found in almost any sizes desired along the beach after a high wind.

Fishes of these seemingly desirable sizes, that is, 150 mm. or more in length; 100 to 125 mm. in length; and less than 100 mm. in length were collected along the beach and brought to the laboratory. All were preserved in 5% formalin.

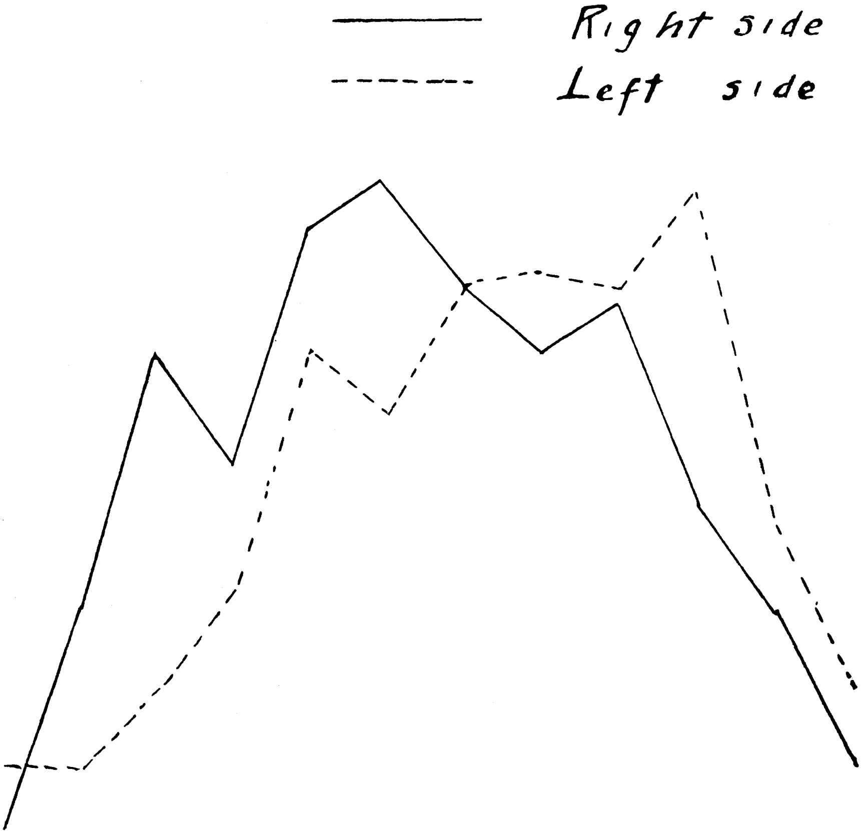
All the scales from the three bands on the three different individuals, each representing one of the three different lengths, were mounted and the data taken. From these data curves were plotted and it was found that the resultant curve for Band 1 and Band 2 were very similar in shape, but that Band 3 was somewhat different. The curves for the three bands of one of these three perch are shown in figures 1, 2, and 3, and the entire data is given in Table 1. If a detailed study of this data is made it will be found that the lowest points of the curves are represented by the extreme scales; that is, the scales from the median dorsal and median ventral lines. In view of the fact that these points seemed so constant for both sides of the fish and for all the fish examined, data was recorded only from the extreme dorsal and ventral scales and the scales from either the second or third row above and below

Figure 2



the lateral line in subsequent tables. In comparing the curves representing the various bands with curves for the corresponding bands on the opposite side of the fish they were found to be similar, which indicates that corresponding scales from opposite sides of a fish are rather uniform but not identical.

Figure 3



The similarity between Band 1 and Band 2 seemed sufficient to warrant the use of only one of these bands. Band 2 was discarded. This should not be taken to indicate that no scales were examined from the vicinity of Band 2 as scales were examined from all parts of the body but data was only recorded for Bands 1 and 3.

Table 1 contains the data collected in the detailed study of the three different sized *Perca flavescens*. It includes averaged data for every scale in the three typical bands. The data for each scale was collected separately and then the corresponding data for each of the several scales of the various series were averaged. The lengths of the three sizes of fishes were, Series 1, 242 mm.; Series 2, 200 mm.; Series 3, 90 mm. A detailed study of this table shows a very great similarity in scales from similar parts of the body. In studying scales from the various fishes it was always found that the scales in the row along the base of the various fins are not well developed and may even fail to show signs of teeth, radii, or lobes. This is very likely due to the position which they occupy and it appears that they are entirely normal for the region which they represent. Many of these scales are covered with skin. Ctenoid scales are in general not heavily covered with skin. This fact may account for the presence of cycloid scales along the base of the fins. It might be contended that the dorsal and ventral scales examined in this work were such scales. This is probably not the case, however, as almost without exception the scales from Band 1 showed radii and lobes. Also a thorough examination was made of all the scales in front of the dorsal fin and they were found to be very much alike. In the scales from the tail region or from Band 3, with very few exceptions, all were highly ctenoid and had both radii and lobes. This brings out a point in regard to the scales of the caudal region. In every *Perca flavescens* examined the scales of that region were found to be highly ctenoid. This was also true of most of the other fishes examined. It shows very well in *Micropterus salmoides* (Lacepede) and *Micropterus dolomieu* Lacepede which have scales that are cycloid or very weakly ctenoid on the anterior part of the body while the posterior part of the body is covered with scales that are heavily ctenoid. In *Perca flavescens* it may be said that, in general, the caudal region is more heavily ctenoid than the anterior region. The biological significance of this fact was not ascertained. Additional protection from rear attacks or for use in connection with spawning (like the pearl organs in the Cyprinids) might be suggested. Again it may have no significance whatever.

If Table 2 is examined it will be found that there are many differences between the scales of the larger fish and those of the smaller fish; also that there are many similarities. It is very noticeable that the number of teeth increase with the size of the fish. Scales from the fish of the larger size have the greater number of teeth, these being twice as numerous as the maximum number in the scales from the smaller fish, in some cases. The teeth on the smaller scales are very pronounced, however, even though some of the scales are very small. This variation in the number of teeth on the scales of the different sized *Perca flavescens* seems to be one of the most certain characters by which the scales from a large fish may be separated from those of a smaller fish. The radii and lobes are much more constant. However, there is a tendency for the smaller scales to have a greater number of lobes than the larger ones. This is correlated with the fact that in nearly all the scales from the smaller fish the radii are usually all complete, while in the scales from the larger fish many of the radii are incomplete. This is also a very sure way to distinguish a small fish from a larger one. The more complete and more numerous radii of the scales of the smaller fish is interesting in view of the fact that the radii in the scales of *Osteoglossidæ* and other more primitive fish are very numerous, complete, and often cross the entire scale, while there is a tendency toward the reduction of the radii in the scales of the higher fish. The scales from the various parts of the body of the fish are variously shaped. Those from the sides are rather broad and the teeth are stout in appearance. Scales from the dorsal and ventral parts of the body vary considerably in shape. Most of them are more or less lop-sided. The scales along the sides near the lateral line decrease in size from the anterior end of the body back toward the caudal end. On the cheek of *Perca flavescens* the scales are not toothed. From a smaller fish the scales do not appear so coarse and the teeth are somewhat more frail. The lobes in the older scales are much more pronounced, the basal end being deeply notched and the individual lobes being more elongated. In the smaller fish the lobes of the scales resemble a series of small semi-circles. In other features the scales appear much alike. Scales from the side of the fish appear more or less rounded and somewhat flattened on the apical and basal ends. A description of a typical *Perca flavescens* scale covering scales from all parts of the body would include the following characteristics: The shape of the scales are from oblong to ovoid with from three (some scales along the base of the various fins without teeth) to seventy-seven teeth on the outer margin of the apical area, varying in size with the size of the individual fish the scales are taken from. The apical area upon which these teeth are set is built up of columnar-like structures. The radii are all basal and extend out from the nucleus, which is situated about one-third of the distance from the top of the apical area to the base of the basal lobes, through the basal area in the form of spokes varying in number from one to twelve. Many circuli extend as semi-circles through the outer part of the basal area of the scale. In the outer part of the scale these circuli are interrupted by the apical area while in the central area they are not but extend around the nucleus as small circles. This is much more pronounced in the scales from the smaller fish than those from the larger fish. In the smaller fish the circuli are all beaded. In the larger fish the circuli in the center are not beaded, evidently having lost them in the course of development. The circuli are beaded in the outer part of the older scales. These points concerning beading are what might be expected since primitive fish have beaded circuli.

Stizostedion vitreum (Mitchill)

The only examination of the scales of *Stizostedion vitreum* was made on the scales of large specimens taken from Carp Creek.

A comparison of the scales of *Perca flavescens* and *Stizostedion vitreum* show dissimilarities in a great many respects. In *Stizostedion vitreum* the scales are more heavily toothed in all parts of the body. The dorsal and ventral scales are also heavily toothed which is not the case in *Perca flavescens*. Also the scales of *Stizostedion vitreum* usually have a decided flange between the apical and basal areas.

In a detailed study of the scales of *Stizostedion vitreum* all the circuli are found to be heavily beaded looking in part as if the circuli were broken in pieces. Also the circuli do not extend through the apical area even in the central part. Whether this would hold for smaller specimens is not known. An examination of scales from all parts of the body showed no regional differences from *Perca flavescens* other than the dorsal and ventral regions being heavily toothed.

Table 3 gives the complete data for the only two specimens of *Stizostedion vitreum* examined.

Boleosma nigrum (Rafinesque)

As *Boleosoma nigrum* is a very common fish in the shoals and along the rocky shore of Douglas Lake, large numbers were available for study.

One of the points in which it differs from the rest of the *Percidæ* is in the fact that the breast and the dorsal parts in front of the dorsal fin are scaleless. Forbes and Richardson* hint that probably more northward the specimens of this fish are more scaly than southward. None of the specimens taken from Douglas Lake, however, were found to have scales on the breast and cheeks, and only a few were found that had scales on the back. In tabulating the data for Table 4 the absence of scales on the breast and dorsal parts of the fish made a slight change in the scales taken necessary. In taking the dorsal scale the data was recorded for the very top scale near the front of the dorsal fin. The ventral scales were taken from the ventral line just back of the ventral fins. This plan was followed throughout regardless of whether the breast was scaled or not.

Boleosoma nigrum being one of the more highly specialized *Percidæ* it would be expected to possess scales of a higher type. This is exactly what is found when the scales are studied. Table 4 shows that all the scales are distinctly ctenoid. The teeth are very prominent and although the scale is rather fragile in appearance it is well developed and the teeth look very formidable.

The data also show that the radii are somewhat more numerous than in either *Perca flavescens* or *Stizostedion vitreum.* When compared with the scales from very small *Perca flavescens* they seem to be somewhat alike although the young *Perca flavescens* scales are much more immature in looks. The lobes appear quite alike. The circuli in *Boleosoma nigrum* as would be expected in a highly specialized fish are plain, appearing as a number of plain line semi-circles and not extending through the apical area.

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*"The Fishes of Illinois," by the Natural History Survey of Illinois. Volume III pp. 297, paragraph 2.

Centrarchidæ

In a further study of scale characteristics the *Centrarchidæ* were selected as a group to be studied. They are very common in Douglas Lake being represented by five different species.

Fifteen different specimens were examined in every case possible. Some, however, are represented by fewer specimens as they were unable to be obtained in greater numbers. Unlike *Perca flavescens* most of the specimens were taken in nets. A few, however, were collected along the beach. In the study of the *Centrarchidæ* the same plan was followed as in the study of the *Percidæ*. Although only data for eight scales were recorded a careful study was made of scales from all parts of the body. The species studied were: *Ambloplites rupestris* (Rafinesque), *Eupomotis gibbosus* (Linnæus), *Lepomis pallidus* (Mitchill), *Micropterus dolomieu* (Lacépède), and *Micropterus salmoides* (Lacépède).

The study of the scales of the *Centrarchidæ* is a varied and interesting one. A typical scale of one of these fish is very much like one of *Perca flavescens* in appearance. The circuli are beaded and do not extend through the apical area except in the very young specimens. In such specimens the circuli passing through the apical area are not beaded. Also in scales from a young *Centrarchidæ* the apical area is entirely covered with circuli. One of the marks that will help to distinguish a *Percidæ* scale from one of a *Centrarchidæ* is that the apical area in a *Percidæ* scale forms a more obtuse angle than in the *Centrarchidæ* scales.

In the *Centrarchidæ* the dorsal and ventral scales do not have the same characteristics as the ventral and dorsal scales of *Perca flavescens*. In *Ambloplites rupestris* the shoulder including the parts of the fish in front of a line drawn from about the fourth dorsal spine to the tip of the pectoral fin and on the ventral surface of the body in front of a line drawn from the base of the ventral fins to the tip of the pectorals, is without ctenoid scales. The scales from these parts of the fishes body are either entirely without teeth or with only traces of teeth. The boundry of these regions vary more or less but in general the above statement will about cover it. Occasionally a ctenoid scale will be found to occur in these regions but it is rather uncommon. In *Eupomotis gibbosus* and *Lepomis pallidus* the dorsal regions correspond with those in *Ambloplites rupestris* as may be seen by the data. The ventral regions are, however, entirely different. In both *Eupomotis gibbosus* and *Lepomis pallidus* the scales from the very lowest ventral parts are all ctenoid. Further up near the opercular flap only traces of teeth are found. In *Ambloplites rupestris* the ventral part of the fish near Band 1 is found to be covered with scales that are distinctly cycloid or almost always so.

In all the *Centrarchidæ* studied the scales from the caudal region were found to be highly ctenoid. The scales along the base of the fins are usually long, irregular in shape, and without teeth, radii, and lobes.

Ambloplites rupestris

The specimens examined varied in length from 17 mm. to 215 mm. The data (Table 7) show how distinctly cycloid the scales from the region of Band 1 are. The data for the scales from Band 3 show that the scales from that region are very decidedly ctenoid. In shape, the scales of *Ambloplites rupestris* are much like a scale from any of the other *Centrarchidæ*.

Lepomis pallidus

The specimens examined were from 52 mm. to 125 mm. in length. Table 9 shows that *Lepomis pallidus* differs from *Ambloplites rupestris* in that the scales from the ventral part of the fish in front of the ventral fins, are ctenoid while in *Ambloplites rupestris* they are cycloid. The scales from the caudal regions of these two fish are quite similar.

Eupomotis gibbosus

The specimens examined varied from 62 mm. to 135 mm. in length. Table 8 shows that the scales are ctenoid except in the region of the shoulder. The ventral scales on Band 1 are ctenoid but farther up the sides near the operculum only traces of teeth are found. The scales from the ventral region show more or less of a tendency to be flanged, that is, the region in which the apical and basal areas meet is wider than the parts of the scale on either side of it.

Micropterus salmoides and Micropterus dolomieu

The scales from *Micropterus salmoides* and *Micropterus dolomieu* will be discussed together as they are both typical *Centrarchidæ* scales and resemble the other *Centrarchidæ* discussed very much. Further, their own relations are better discussed when they are considered together. The cycloid regions in these fish are quite similar. It is also very much more extensive than in any of the other *Centrarchidæ* studied. These scales from all the anterior part of the body regardless of their position are cycloid or at most very weakly ctenoid. The posterior part of the fish is covered with scales that are highly ctenoid. If scales are selected and examined from the posterior end of the fish forward they are found to gradually pass from ctenoid to cycloid. Only a few fish were available for the work so that a more detailed study is lacking. From the data at hand it appears that the ctenoid scales extend as far forward as about the third or fourth ray of the dorsal fin. In the study of a large number of scales from the different specimens it was found that *Micropterus salmoides* shows a tendency to be more heavily ctenoid than does *Micropterus dolomieu.* A description of a typical scale will suffice for either of these two fish. In the younger specimens the circuli extend around the nucleus, passing through the apical area, and are beaded, while in scales from the adults the circuli extending through the apical area are not so numerous and also the circuli in the central part of the scale are not beaded. The outer circuli in the adult scales are very much broken and show very distinctly a tendency to form teeth.

Percopsis guttatus (Agassiz)

The study of the *Percopsidæ* was made upon *Percopsis guttatus.* They varied in length from 75 mm. to 87 mm. This fish has a scale which is very different from either the *Percidæ* or *Centrarchidæ.* It has no radii or lobes. The nuclear area is located far up near the apical end. Also the plain circuli in the central area near the nucleus extends through both the apical and basal areas. These circuli appear to be broken in places. Farther out they are interrupted by the very small apical area.

The teeth are small but very pronounced. They are very different from those on the scales of *Percidæ* or *Centrarchidæ* in that the apical area is not composed of columnar-like structures. Although the teeth are well formed they appear rather weak due to the fact that the apical area lacks the columnar-like structures. The number of teeth on each side scale varies from 2 to 22 and as in both the *Percidæ* and the *Centrarchidæ* the posterior end of the body is more heavily ctenoid than the anterior end. The nuclear area is also nearer the top of the apical area than in the *Percidæ* and *Centrarchidæ.*

In *Percopsis guttatus* the dorsal part of the body in front of the dorsal fin is scaleless. The table does not include this region. The first data recorded represents a scale from the second row above the lateral line in every case. Table 5 contains the data collected on *Percopsis guttatus.*

Esox Lucius (Linnæus)

The scales of *Esox lucius* show the characters of a more primitive fish when compared with those of one of the more highly specialized fish examined. The scales are entirely without teeth. The number of radii found were from one to four and the number of lobes varied from one to three. In many of the scales the lobes were found to be separated from each other and the rest of the scale, in many cases, over half way to the nuclear area.

The circuli are plain and somewhat irregular. They extend as circles through both the apical and basal areas. In the center near the nucleus they become irregular in shape. In many of the scales examined there were irregularities in the upper portion of the apical area which may be an indication of teeth forming. Table 6 gives the data collected on the two sizes of *Esox lucius.*

SUMMARY

It has been very recently that scale characters have been considered seriously as a method of distinguishing between different fishes. Undoubtedly external features are a quicker method by which to identify a fish, but if only a small portion of the fish is available then the method of identification by scale characteristics becomes very valuable, if these characteristics are stable. That they are stable seems almost conclusively proven from the data at hand. A few of the essential differences in the scale characteristics of the fish studied may be enumerated.

In *Perca flavescens* the dorsal row of scales in front of the dorsal fin, and the ventral row of scales in front of the ventral fins, are not ctenoid. The rest of the dorsal patch which may be designated as all the scales in front of a line drawn from the anterior end of the dorsal fin to the corner of the operculum, and all of the ventral patch which may be designated as all the scales included in the region in front of a line drawn from the base of the ventral fins to the corner of the operculum, is covered with scales which are toothed very heavily. This is not true of any other fish studied. The scales of *Boleosoma nigrum* are ctenoid on all parts of the body. If a scale of a small *Perca flavescens* is compared with a scale from *Boleosoma nigrum* they can be readily distinguished from each other regardless of the sizes of the fishes that they are selected from. The scale from a *Boleosoma nigrum* is a mature looking scale. It is well formed and looks as formidable as a very mature scale from a *Perca flavescens*. The scales from a small *Perca flavescens* have a rather immature appearance and are easily distinguished as scales from an immature fish. In such scales the columnar structures are not well formed and altogether the scale looks frail in comparison with one from *Boleosoma nigrum*. Also *Boleosoma nigrum* lack the scales on the breast.

In the *Centrarchids* studied the whole shoulder patch is without ctenoid scales. The ventral patch is different. In *Lepomis pallidus* and *Eupomotis gibbosus* the ventral patch is covered with ctenoid scales, the teeth being more or less lacking up near the operculum. The scales of *Ambloplites rupestris* are cycloid on all the ventral patch distinguishing it at once from either *Lepomis pallidus* or *Eupomotis gibbosus*.

Micropterus dolomieu and *Micropterus salmoides* are distinguished from the *Percidæ* and *Centrarchidæ* studied by the absence of ctenoid scales on the anterior part of the body. This region with only cycloid scales extends back to about the third or fourth ray of the dorsal fin.

Esox lucius is easily distinguished from the rest of the fish studied by the body being entirely covered with cycloid scales. Also the lobes are distinctly separated from one another by the radii, almost one-half of the distance to the nucleus.

Percopsis guttatus scales may be identified by the absence of any columnar-like structures in the apical area.

The work so far as it has been carried out and so far as the data can be interpreted seems very satisfactory. Many striking similarities are seen between the scales of different fishes from the same families. Also many differences are evident in the scales from fishes of the various families. In every case, however, the scales of the primitive fish have shown characteristics of primitive scales, and the scales of the specialized fishes have shown characteristics of highly developed scales.

Scale characters as a means of identification would probably be very little affected by regeneration as the percentage of regenerated scales is small. The percentage of regeneration in all the scales of a single specimen of *Amblophtes rupestris* about 200 mm. long was 12%.

TABLE I.

★Location and Number of Scales	Fish 1.												Length 242 mm.											
	Right Side												Left Side											
	Band 1				Band 2				Band 3				Band 1				Band 2				Band 3			
	Teeth	Complete radii	Incomplete radii	Lobes	Teeth	Complete radii	Incomplete radii	Lobes	Teeth	Complete radii	Incomplete radii	Lobes	Teeth	Complete radii	Incomplete radii	Lobes	Teeth	Complete radii	Incomplete radii	Lobes	Teeth	Complete radii	Incomplete radii	Lobes
8 above	..	..	..	..	..	..	..	..	0	0	0	0	..	..	..	..	..	..	..	..	..	..	..	..
7 “	..	..	..	..	..	..	..	..	0	5	0	0	..	..	..	..	..	..	..	..	14	[illegible]	0	2
6 “	0	5	1	4	0	4	1	3	11	4	3	3	..	..	..	..	15	4	0	3	20	4	1	2
5 “	0	5	1	5	53	4	2	3	17	3	4	2	0	8	0	7	20	0	8	1	15	3	0	2
4 “	32	4	2	4	64	6	1	5	14	3	1	4	37	7	0	6	68	9	0	8	28	2	1	2
3 “	33	3	3	2	53	6	0	5	24	5	3	6	44	5	2	4	65	10	1	11	28	7	1	7
2 “	44	5	1	4	59	11	0	10	55	6	3	3	57	4	3	4	64	8	1	7	45	8	1	6
1 “	30	5	2	4	59	5	0	5	57	6	2	6	52	5	2	7	48	7	2	6	44	7	1	6
1 below	81	5	1	4	50	5	2	4	67	10	2	10	50	5	3	4	61	6	1	5	51	9	2	7
2 “	60	4	2	5	56	5	1	4	58	10	2	9	50	6	1	6	55	7	0	6	66	11	3	7
3 “	49	4	2	4	61	6	1	6	47	7	4	6	65	7	1	8	55	6	0	5	62	11	1	9
4 “	48	8	0	7	56	6	1	5	14	4	5	4	68	6	1	6	61	5	0	4	28	10	2	7
5 “	48	4	2	4	66	5	0	4	19	7	5	6	63	6	1	6	68	5	1	4	11	6	0	5
6 “	30	7	0	6	60	4	1	4	*	5	7	5	43	7	1	6	55	5	1	4	14	2	0	1
7 “	13	0	8	1	65	6	0	6	0	4	0	0	0	5	1	3	73	7	0	6	11	6	3	2
8 “	..	..	..	..	62	5	1	5	0	2	0	1	..	..	..	..	62	6	1	5	0	2	0	1
9 “	..	..	..	..	77	5	1	5	..	..	..	..	..	..	..	..	63	6	2	5	..	..	..	..
10 “	..	..	..	..	76	2	4	2	..	..	..	..	..	..	..	..	75	6	0	5	..	..	..	..
11 “	..	..	..	..	70	5	1	4	..	..	..	..	..	..	..	..	77	5	1	5	..	..	..	..
12 “	..	..	..	..	65	4	2	3	..	..	..	..	..	..	..	..	75	5	1	5	..	..	..	..
13 “	..	..	..	..	60	4	2	7	..	..	..	..	..	..	..	..	72	4	1	3	..	..	..	..
14 “	..	..	..	..	0	2	0	2	..	..	..	..	..	..	..	..	0	2	1	1	..	..	..	..
	Fish 2.												Length 20 mm.											
7 above	3	2	1	2	13	2	0	1	..	..	..	..	3	3	1	2	..	..	..	..	..	..	..	..
6 “	31	6	1	5	22	5	1	4	12	3	0	2	R	3	0	3	0	1	1	0	16	1	2	0
5 “	37	4	3	3	33	4	2	3	26	5	2	5	33	4	0	3	32	2	2	3	16	4	3	4
4 “	37	2	4	3	47	7	0	6	42	9	1	7	38	2	4	3	41	6	1	6	21	5	1	4
3 “	41	1	6	3	39	5	0	4	35	9	3	10	42	1	3	1	44	7	1	6	27	3	5	4
2 “	33	3	0	4	44	6	0	5	50	5	1	4	40	3	0	2	46	6	1	5	42	4	4	3
1 “	46	4	0	3	56	5	2	6	53	4	1	3	28	5	1	5	32	5	0	4	38	5	1	5
1 below	48	4	0	3	31	5	0	4	46	5	1	4	51	7	0	6	33	7	0	6	46	4	2	4
2 “	44	5	1	5	48	5	1	5	42	4	2	3	47	7	0	6	45	6	0	5	47	3	1	2
3 “	57	5	2	5	52	5	0	4	45	4	1	3	62	7	0	6	48	5	0	4	46	5	1	4
4 “	65	6	0	6	51	6	0	5	32	6	0	5	60	6	0	6	53	5	1	4	52	4	2	3
5 “	50	6	0	5	50	6	0	5	25	4	1	3	51	7	1	6	53	5	0	4	31	5	1	4
6 “	67	7	1	7	56	5	0	4	15	2	0	1	54	5	3	4	57	5	1	5	20	2	3	1
7 “	62	6	2	6	57	6	0	5	..	..	..	..	57	6	3	6	48	5	0	4	..	..	..	..
8 “	60	6	3	4	61	4	2	3	..	..	..	..	R	5	2	4	40	6	1	6	..	..	..	..
9 “	R	5	1	5	57	5	0	4	..	..	..	..	59	3	5	4	54	5	1	4	..	..	..	..
10 “	12	3	0	2	57	3	1	2	..	..	..	..	R	5	2	5	55	5	0	4	..	..	..	..
11 “	40	4	0	3	57	6	0	5	..	..	..	..	18	6	0	5	65	6	1	5	..	..	..	..
12 “	34	3	0	2	52	6	1	5	..	..	..	..	35	4	2	4	60	5	1	5	..	..	..	..
13 “	R	3	3	3	28	5	0	4	..	..	..	..	31	2	2	2	31	4	1	3	..	..	..	..
14 “	19	2	2	2	14	4	1	3	..	..	..	..	30	1	1	0	14	0	2	0	..	..	..	..
15 “	10	1	2	0	0	0	0	0	..	..	..	..	0	4	0	3	13	1	0	0	..	..	..	..
	Fish 3.												Length 90 mm.											
6 above	12	7	0	7	6	5	0	4	4	3	0	2	0	7	0	6	..	..	..	..	..	..	..	..
5 “	13	8	0	8	19	8	4	10	6	5	0	4	0	7	0	7	8	4	0	3	0	8	0	7
4 “	11	10	0	10	18	8	1	8	R	12	0	11	5	6	0	5	15	7	1	6	7	7	0	6
3 “	13	7	0	8	25	9	1	9	12	7	0	6	11	7	0	6	25	8	0	7	8	8	0	7
2 “	20	10	0	10	14	9	0	8	18	8	0	7	10	8	1	8	22	9	0	8	25	9	0	8
1 “	17	7	0	6	22	8	0	7	21	9	2	8	18	6	1	5	21	8	0	7	15	10	0	9
1 below	22	9	0	8	29	7	1	6	19	7	0	6	28	8	1	8	31	9	1	8	24	7	3	6
2 “	28	8	0	7	24	7	0	6	7	10	0	9	30	8	0	7	24	6	0	5	12	5	0	4
3 “	32	7	0	7	28	7	0	6	11	9	0	8	37	8	0	9	24	7	0	6	15	8	0	7
4 “	31	8	0	7	27	7	0	6	8	11	0	10	37	10	0	6	27	6	0	5	18	7	1	6
5 “	31	7	0	6	29	6	0	5	6	8	0	7	34	7	0	7	31	6	1	5	11	7	1	6
6 “	30	8	0	7	26	6	0	5	..	..	..	..	25	8	0	6	28	7	0	6	..	..	..	..
7 “	39	10	1	9	29	6	0	5	..	..	..	..	27	10	0	9	28	8	0	7	..	..	..	..
8 “	33	8	0	7	26	8	0	7	..	..	..	..	24	7	0	6	29	6	0	5	..	..	..	..
9 “	25	7	1	6	26	8	0	7	..	..	..	..	24	6	1	5	28	6	1	5	..	..	..	..
10 “	25	6	0	5	30	8	0	7	..	..	..	..	22	8	0	7	27	8	0	7	..	..	..	..
11 “	22	6	0	5	19	5	0	4	..	..	..	..	21	7	0	6	26	7	0	6	..	..	..	..
12 “	25	7	0	6	24	7	0	6					24	6	0	5								

Perca flavescens. 1

Band 1						
	Teeth			Radii		
Location of Scale	Min.	Av.	Max.	Min	Av.	Max.
D	0	1	10	0	4	6
2A	29	39	50	5	6	13
2B	27	48	60	6	7	10
V	0	1	13	1	5	8
Perca flavescens. 15 spec						
D	0	2	12	0	5	9
2A	17	21	28	0	9	12
2B	22	32	37	6	7	10
V	0	3	21	3	6	9
Perca flavescens. 15 spec						
D	0	2	8	2	4	7
2A	4	11	21	4	6	9
2B	5	19	28	5	7	8
V	0	3	11	7	4	3
Stizostedion vitreum. 2 sp						
D	14	20	26	3	3	3
2A	50	50	51	6	6	6
2B	55	56	56	6	8	9
V	33	36	38	5	6	6
Boleosoma nigrum. 15 sp						
D	5	11	15	6	9	10
2A	12	18	26	8	11	16
2B	7	21	30	9	14	19
V	0	8	17	6	8	10
Percopsis guttatus. 15 speci						
D	0	0	0	0	0	0
2A	5	10	22	0	0	0
2B	3	12	17	0	0	0
V	2	6	11	0	0	0
Esox lucius. 4 specim						
D	0	0	0	0	0	0
2A	0	0	0	2	2	3
2B	0	0	0	1	2	4
V	0	0	0	1	2	2
Esox lucius. 2 specim						
D	0	0	0	0	0	0
2A	0	0	0	2	2	2
2B	0	0	0	2	2	2
V	0	0	0	0	2	4
Ambloplites rupestris. 15 s						
D	0	0	0	1	3	6
2A	0	6	18	9	12	16
2B	0	24	38	9	12	18
V	0	0	0	5	7	9

Eupomotis gibbosus. 15 spec						
Band 1						
	Teeth			Radii		
Location of Scale	Min.	Av.	Max.	Min.	Av.	Max.
D	0	0	3	0	4	7
2A	0	0	0	10	11	14
2B	0	27	45	7	9	11
V	0	23	54	5	7	10
Lepomis Pallidus. 7 specin						
D	0	0	0	3	5	6
2A	0	0	0	11	12	15

Length 242 mm.									
Left Side									
d 1		Band 2				Band 3			
Incomplete radii	Lobes	Teeth	Complete radii	Incomplete radii	Lobes	Teeth	Complete radii	Incomplete radii	Lobes
..	..	..	..	..	..	..	..	..	..
..	..	..	..	..	..	14	[illegible]	0	2
..	..	15	4	0	3	20	4	1	2
0	7	20	0	8	1	15	3	0	2
0	6	68	9	0	8	28	2	1	2
2	4	65	10	1	11	28	7	1	7
3	4	64	8	1	7	45	8	1	6
2	7	48	7	2	6	44	7	1	6
3	4	61	6	1	5	51	9	2	7
1	6	55	7	0	6	66	11	3	7
1	8	55	6	0	5	62	11	1	9
1	6	61	5	0	4	28	10	2	7
1	6	68	5	1	4	11	6	0	5
1	6	55	5	1	4	14	2	0	1
1	3	73	7	0	6	11	6	3	2
..	..	62	6	1	5	0	2	0	1
..	..	63	6	2	5	..	..	..	..
..	..	75	6	0	5	..	..	..	..
..	..	77	5	1	5	..	..	..	..
..	..	75	5	1	5	..	..	..	..
..	..	72	4	1	3	..	..	..	..
..	..	0	2	1	1	..	..	..	..
Length 20 mm.									
1	2	..	..	..	..	..	..	..	..
0	3	0	1	1	0	16	1	2	0
0	3	32	2	2	3	16	4	3	4
4	3	41	6	1	6	21	5	1	4
3	1	44	7	1	6	27	3	5	4
0	2	46	6	1	5	42	4	4	3
1	5	32	5	0	4	38	5	1	5
0	6	33	7	0	6	46	4	2	4
0	6	45	6	0	5	47	3	1	2
0	6	48	5	0	4	46	5	1	4
0	6	53	5	1	4	52	4	2	3
1	6	53	5	0	4	31	5	1	4
3	4	57	5	1	5	20	2	3	1
3	6	48	5	0	4	..	..	..	..
2	4	40	6	1	6	..	..	..	..
5	4	54	5	1	4	..	..	..	..
2	5	55	5	0	4	..	..	..	..
0	5	65	6	1	5	..	..	..	..
2	4	60	5	1	5	..	..	..	..
2	2	31	4	1	3	..	..	..	..
1	0	14	0	2	0	..	..	..	..
0	3	13	1	0	0	..	..	..	..
Length 90 mm.									
0	6	..	..	..	..	..	..	..	..
0	7	8	4	0	3	0	8	0	7
0	5	15	7	1	6	7	7	0	6
0	6	25	8	0	7	8	8	0	7
1	8	22	9	0	8	25	9	0	8
1	5	21	8	0	7	15	10	0	9
1	8	31	9	1	8	24	7	3	6
0	7	24	6	0	5	12	5	0	4
0	9	24	7	0	6	15	8	0	7
0	6	27	6	0	5	18	7	1	6
0	7	31	6	1	5	11	7	1	6
0	6	28	7	0	6	..	..	..	..
0	9	28	8	0	7	..	..	..	..
0	6	29	6	0	5	..	..	..	..
1	5	28	6	1	5	..	..	..	..
0	7	27	8	0	7	..	..	..	..
0	6	26	7	0	6	..	..	..	..
0	5								

Perca flavescens. 15 specimens. Length—150-250 mm. Table 2

Band 1										Band 2									
	Teeth			Radii			Lobes				Teeth			Radii			Lobes		
Location of Scale	Min.	Av.	Max.	Min	Av.	Max.	Min.	Av.	Max.	Location of Scale	Min.	Av.	Max.	Min.	Av.	Max.	Min.	Av.	Max.
D	0	1	10	0	4	6	0	3	5	D	8	15	25	0	3	7	0	2	5
2A	29	39	50	5	6	13	4	5	12	2A	19	38	55	4	8	14	3	6	12
2B	27	48	60	6	7	10	5	6	9	2B	31	42	58	6	10	12	4	7	11
V	0	1	13	1	5	8	0	4	6	V	0	16	23	2	4	6	0	2	5
Perca flavescens. 15 specimens.										Length 100-125 mm. Table 2 Cont.									
D	0	2	12	0	5	9	2	4	8	D	0	7	12	0	4	9	0	3	8
2A	17	21	28	0	9	12	4	7	11	2A	8	22	30	7	9	12	6	8	10
2B	22	32	37	6	7	10	5	6	9	2B	13	21	31	4	7	10	3	6	9
V	0	3	21	3	6	9	2	5	8	V	0	9	15	1	5	10	0	4	8
Perca flavescens. 15 specimens.										Length 35-100 mm. Table 2 Cont.									
D	0	2	8	2	4	7	0	6	12	D	0	6	12	2	4	7	1	3	6
2A	4	11	21	4	6	9	6	12	21	2A	4	11	21	3	6	8	2	5	8
2B	5	19	28	5	7	8	5	13	18	2B	6	13	19	4	6	9	3	5	8
V	0	3	11	7	4	3	2	5	10	V	2	6	11	2	4	7	1	3	6
Stizostedion vitreum. 2 specimens.										Length 420-480 mm. Table 3									
D	14	20	26	3	3	3	2	2	2	D	7	10	13	1	1	1	0	0	0
2A	50	50	51	6	6	6	5	5	5	2A	46	50	53	5	6	6	4	5	5
2B	55	56	56	6	8	9	5	7	8	2B	45	49	52	5	5	5	4	4	4
V	33	36	38	5	6	6	4	5	5	V	4	5	6	1	2	3	0	1	2
Boleosoma nigrum. 15 specimens										Length 35-47 mm. Table 4									
D	5	11	15	6	9	10	5	7	9	D	0	8	13	0	4	8	0	3	7
2A	12	18	26	8	11	16	7	10	15	2A	7	16	27	6	9	12	5	8	11
2B	7	21	30	9	14	19	8	13	18	2B	8	17	30	4	9	14	3	8	13
V	0	8	17	6	8	10	5	6	10	V	2	6	11	1	4	6	0	3	5
Percopsis guttatus. 15 specimens										Length 70-87 mm. Table 5									
D	0	0	0	0	0	0	0	0	0	D	0	4	10	0	0	0	0	0	0
2A	5	10	22	0	0	0	0	0	0	2A	8	14	19	0	0	0	0	0	0
2B	3	12	17	0	0	0	0	0	0	2B	11	7	21	0	0	0	0	0	0
V	2	6	11	0	0	0	0	0	0	V	0	6	10	0	0	0	0	0	0
Esox lucius. 4 specimens										Length 300-410 mm. Table 6									
D	0	0	0	0	0	0	0	0	0	D	0	0	0	0	0	1	0	0	0
2A	0	0	0	2	2	3	1	1	2	2A	0	0	0	2	2	3	1	1	2
2B	0	0	0	1	2	4	1	1	3	2B	0	0	0	2	2	3	1	1	2
V	0	0	0	1	2	2	1	1	1	V	0	0	0	0	0	0	0	0	0
Esox lucius. 2 specimens										Length 95-168 mm. Table 6 Cont.									
D	0	0	0	0	0	0	0	0	0	D	0	0	0	0	0	0	0	0	0
2A	0	0	0	2	2	2	1	1	1	2A	0	0	0	2	2	2	1	1	1
2B	0	0	0	2	2	2	1	1	1	2B	0	0	0	1	2	2	0	1	1
V	0	0	0	0	2	4	0	2	3	V	0	0	0	0	1	2	0	1	1
Ambloplites rupestris. 15 specimens										Length 140-215 mm. Table 7									
D	0	0	0	1	3	6	0	2	5	D	0	16	24	0	2	6	0	1	5
2A	0	6	18	9	12	16	8	11	15	2A	19	36	57	6	11	16	5	10	17
2B	0	24	38	9	12	18	8	11	17	2B	16	42	60	7	11	20	16	10	19
V	0	0	0	5	7	9	4	6	8	V	0	10	18	0	3	7	0	2	6

TABLES 2-7

Eupomotis gibbosus. 15 specimens										Length 100-135 mm. Table 8									
Band 1										Band 3									
	Teeth			Radii			Lobes				Teeth			Radii			Lobes		
Location of Scale	Min.	Av.	Max.	Min.	Av.	Max.	Min.	Av.	Max.	Location of Scale	Min.	Av.	Max.	Min.	Av.	Max.	Min.	Av.	Max.
D	0	0	3	0	4	7	0	3	6	D	0	4	18	0	3	7	0	2	6
2A	0	0	0	10	11	14	9	10	13	2A	20	31	45	5	8	11	7	4	10
2B	0	27	45	7	9	11	6	8	11	2B	17	35	56	5	8	11	2	7	10
V	0	23	54	5	7	10	4	5	9	V	0	2	9	0	3	8	0	2	7
Lepomis Pallidus. 7 specimens										Length 45-100 mm. Table 9									
D	0	0	0	3	5	6	2	4	5	D	0	4	12	1	2	4	0	1	3
2A	0	0	0	11	12	15	10	11	14	2A	0	26	41	6	10	13	5	9	12

10 "	..	..	..	..	76	2	4	2	..	..	..	..	..	..	..	..	75	6	0	5	..	..	..	..
11 "	..	..	..	..	70	5	1	4	..	..	..	..	..	..	..	..	77	5	1	5	..	..	..	..
12 "	..	..	..	..	65	4	2	3	..	..	..	..	..	..	..	..	75	5	1	5	..	..	..	..
13 "	..	..	..	..	60	4	2	7	..	..	..	..	..	..	..	..	72	4	1	3	..	..	..	..
14 "	..	..	..	..	0	2	0	2	..	..	..	..	..	..	..	..	0	2	1	1	..	..	..	..
Fish 2.																	Length 20 mm.							
7 above	3	2	1	2	13	2	0	1	..	..	..	..	3	3	1	2	..	..	..	..	..	..	..	..
6 "	31	6	1	5	22	5	1	4	12	3	0	2	R	3	0	3	0	1	1	0	16	1	2	0
5 "	37	4	3	3	33	4	2	3	26	5	2	5	33	4	0	3	32	2	2	3	16	4	3	4
4 "	37	2	4	3	47	7	0	6	42	9	1	7	38	2	4	3	41	6	1	6	21	5	1	4
3 "	41	1	6	3	39	5	0	4	35	9	3	10	42	1	3	1	44	7	1	6	27	3	5	4
2 "	33	3	0	4	44	6	0	5	50	5	1	4	40	3	0	2	46	6	1	5	42	4	4	3
1 "	46	4	0	3	56	5	2	6	53	4	1	3	28	5	1	5	32	5	0	4	38	5	1	5
1 below	48	4	0	3	31	5	0	4	46	5	1	4	51	7	0	6	33	7	0	6	46	4	2	4
2 "	44	5	1	5	48	5	1	5	42	4	2	3	47	7	0	6	45	6	0	5	47	3	1	2
3 "	57	5	2	5	52	5	0	4	45	4	1	3	62	7	0	6	48	5	0	4	46	5	1	4
4 "	65	6	0	6	51	6	0	5	32	6	0	5	60	6	0	6	53	5	1	4	52	4	2	3
5 "	50	6	0	5	50	6	0	5	25	4	1	3	51	7	1	6	53	5	0	4	31	5	1	4
6 "	67	7	1	7	56	5	0	4	15	2	0	1	54	5	3	4	57	5	1	5	20	2	3	1
7 "	62	6	2	6	57	6	0	5	..	..	..	..	57	6	3	6	48	5	0	4	..	..	..	..
8 "	60	6	3	4	61	4	2	3	..	..	..	..	R	5	2	4	40	6	1	6	..	..	..	..
9 "	R	5	1	5	57	5	0	4	..	..	..	..	59	3	5	4	54	5	1	4	..	..	..	..
10 "	12	3	0	2	57	3	1	2	..	..	..	..	R	5	2	5	55	5	0	4	..	..	..	..
11 "	40	4	0	3	57	6	0	5	..	..	..	..	18	6	0	5	65	6	1	5	..	..	..	..
12 "	34	3	0	2	52	6	1	5	..	..	..	..	35	4	2	4	60	5	1	5	..	..	..	..
13 "	R	3	3	3	28	5	0	4	..	..	..	..	31	2	2	2	31	4	1	3	..	..	..	..
14 "	19	2	2	2	14	4	1	3	..	..	..	..	30	1	1	0	14	0	2	0	..	..	..	..
15 "	10	1	2	0	0	0	0	0	..	..	..	..	0	4	0	3	13	1	0	0	..	..	..	..
Fish 3.																	Length 90 mm.							
6 above	12	7	0	7	6	5	0	4	4	3	0	2	0	7	0	6	..	..	..	..	..	..	..	..
5 "	13	8	0	8	19	8	4	10	6	5	0	4	0	7	0	7	8	4	0	3	0	8	0	7
4 "	11	10	0	10	18	8	1	8	R	12	0	11	5	6	0	5	15	7	1	6	7	7	0	6
3 "	13	7	0	8	25	9	1	9	12	7	0	6	11	7	0	6	25	8	0	7	8	8	0	7
2 "	20	10	0	10	14	9	0	8	18	8	0	7	10	8	1	8	22	9	0	8	25	9	0	8
1 "	17	7	0	6	22	8	0	7	21	9	2	8	18	6	1	5	21	8	0	7	15	10	0	9
1 below	22	9	0	8	29	7	1	6	19	7	0	6	28	8	1	8	31	9	1	8	24	7	3	6
2 "	28	8	0	7	24	7	0	6	7	10	0	9	30	8	0	7	24	6	0	5	12	5	0	4
3 "	32	7	0	7	28	7	0	6	11	9	0	8	37	8	0	9	24	7	0	6	15	8	0	7
4 "	31	8	0	7	27	7	0	6	8	11	0	10	37	10	0	6	27	6	0	5	18	7	1	6
5 "	31	7	0	6	29	6	0	5	6	8	0	7	34	7	0	7	31	6	1	5	11	7	1	6
6 "	30	8	0	7	26	6	0	5	..	..	..	..	25	8	0	6	28	7	0	6	..	..	..	..
7 "	39	10	1	9	29	6	0	5	..	..	..	..	27	10	0	9	28	8	0	7	..	..	..	..
8 "	33	8	0	7	26	8	0	7	..	..	..	..	24	7	0	6	29	6	0	5	..	..	..	..
9 "	25	7	1	6	26	8	0	7	..	..	..	..	24	6	1	5	28	6	1	5	..	..	..	..
10 "	25	6	0	5	30	8	0	7	..	..	..	..	22	8	0	7	27	8	0	7	..	..	..	..
11 "	22	6	0	5	19	5	0	4	..	..	..	..	21	7	0	6	26	7	0	6	..	..	..	..
12 "	25	7	0	6	24	7	0	6	..	..	..	..	24	6	0	5	..	..	..	..	..	..	..	..
13 "	25	6	0	5	4	2	0	1	..	..	..	..	26	5	0	4	..	..	..	..	..	..	..	..
14 "	19	7	0	6	..	..	..	..	..	..	..	..	24	5	0	5	..	..	..	..	..	..	..	..
15 "	21	8	0	6	..	..	..	..	..	..	..	..	16	5	0	4	..	..	..	..	..	..	..	..

★ **1, 2, and 3, etc., above=1st., 2nd., 3rd., etc., scales above lateral line.**
1, 2, and 3, etc., below=1st., 2nd., 3rd., etc., scales below lateral line.
R=regenerated scales.

V	33	36	38	5	6	6
Boleosoma nigrum. 15 spe						
D	5	11	15	6	9	10
2A	12	18	26	8	11	16
2B	7	21	30	9	14	19
V	0	8	17	6	8	10
Percopsis guttatus. 15 speci						
D	0	0	0	0	0	0
2A	5	10	22	0	0	0
2B	3	12	17	0	0	0
V	2	6	11	0	0	0
Esox lucius. 4 specim						
D	0	0	0	0	0	0
2A	0	0	0	2	2	3
2B	0	0	0	1	2	4
V	0	0	0	1	2	2
Esox lucius. 2 specim						
D	0	0	0	0	0	0
2A	0	0	0	2	2	2
2B	0	0	0	2	2	2
V	0	0	0	0	2	4
Ambloplites rupestris. 15 s						
D	0	0	0	1	3	6
2A	0	6	18	9	12	16
2B	0	24	38	9	12	18
V	0	0	0	5	7	9

Eupomotis gibbosus. 15 spe							
Band 1							
Teeth				Radii			
Location of Scale	Min.	Av.	Max.	Min.	Av.	Max.	M
D	0	0	3	0	4	7	
2A	0	0	0	10	11	14	
2B	0	27	45	7	9	11	
V	0	23	54	5	7	10	
Lepomis Pallidus. 7 specin							
D	0	0	0	3	5	6	
2A	0	0	0	11	12	15	
2B	11	17	20	6	9	10	
V	0	6	31	4	6	9	
Lepomis pallidus. 7 specin							
D	0	0	0	3	4	6	
2A	0	2	7	10	14	16	
2B	6	24	53	7	8	10	
V	5	13	39	4	5	7	
Microterus salmoides. 6 spec							
D	0	0	0	3	4	5	
2A	0	0	3	4	8	10	
2B	3	2	6	5	7	8	
V	0	1	3	0	4	6	
Micropterus salmoides. 6 spec							
D	0	0	0	1	2	3	
2A	0	0	0	6	7	8	
2B	0	0	0	7	7	8	
V	0	0	0	2	2	2	
Micropterus dolomieu. 3 spec							
D	0	0	0	2	2	2	
2A	0	0	0	8	8	8	
2B	0	0	0	5	5	5	
V	0	0	0	3	3	3	

..	..	75	6	0	5	..	..	..	..
..	..	77	5	1	5	..	..	..	..
..	..	75	5	1	5	..	..	..	..
..	..	72	4	1	3	..	..	..	..
..	..	0	2	1	1	..	..	..	..
Length 20 mm.									
1	2	..	..	..	..	..	..	..	..
0	3	0	1	1	0	16	1	2	0
0	3	32	2	2	3	16	4	3	4
4	3	41	6	1	6	21	5	1	4
3	1	44	7	1	6	27	3	5	4
0	2	46	6	1	5	42	4	4	3
1	5	32	5	0	4	38	5	1	5
0	6	33	7	0	6	46	4	2	4
0	6	45	6	0	5	47	3	1	2
0	6	48	5	0	4	46	5	1	4
0	6	53	5	1	4	52	4	2	3
1	6	53	5	0	4	31	5	1	4
3	4	57	5	1	5	20	2	3	1
3	6	48	5	0	4	..	..	..	..
2	4	40	6	1	6	..	..	..	..
5	4	54	5	1	4	..	..	..	..
2	5	55	5	0	4	..	..	..	..
0	5	65	6	1	5	..	..	..	..
2	4	60	5	1	5	..	..	..	..
2	2	31	4	1	3	..	..	..	..
1	0	14	0	2	0	..	..	..	..
0	3	13	1	0	0	..	..	..	..
Length 90 mm.									
0	6	..	..	..	..	..	..	..	..
0	7	8	4	0	3	0	8	0	7
0	5	15	7	1	6	7	7	0	6
0	6	25	8	0	7	8	8	0	7
1	8	22	9	0	8	25	9	0	8
1	5	21	8	0	7	15	10	0	9
1	8	31	9	1	8	24	7	3	6
0	7	24	6	0	5	12	5	0	4
0	9	24	7	0	6	15	8	0	7
0	6	27	6	0	5	18	7	1	6
0	7	31	6	1	5	11	7	1	6
0	6	28	7	0	6	..	..	..	..
0	9	28	8	0	7	..	..	..	..
0	6	29	6	0	5	..	..	..	..
1	5	28	6	1	5	..	..	..	..
0	7	27	8	0	7	..	..	..	..
0	6	26	7	0	6	..	..	..	..
0	5	..	..	..	..	..	..	..	..
0	4	..	..	..	..	..	..	..	..
0	5	..	..	..	..	..	..	..	..
0	4	..	..	..	..	..	..	..	..

l line.
line.

V	33	36	38	5	6	6	4	5	5	V	4	5	6	1	2	3	0	1	2
Boleosoma nigrum. 15 specimens										Length 35-47 mm. Table 4									
D	5	11	15	6	9	10	5	7	9	D	0	8	13	0	4	8	0	3	7
2A	12	18	26	8	11	16	7	10	15	2A	7	16	27	6	9	12	5	8	11
2B	7	21	30	9	14	19	8	13	18	2B	8	17	30	4	9	14	3	8	13
V	0	8	17	6	8	10	5	6	10	V	2	6	11	1	4	6	0	3	5
Percopsis guttatus. 15 specimens										Length 70-87 mm. Table 5									
D	0	0	0	0	0	0	0	0	0	D	0	4	10	0	0	0	0	0	0
2A	5	10	22	0	0	0	0	0	0	2A	8	14	19	0	0	0	0	0	0
2B	3	12	17	0	0	0	0	0	0	2B	11	7	21	0	0	0	0	0	0
V	2	6	11	0	0	0	0	0	0	V	0	6	10	0	0	0	0	0	0
Esox lucius. 4 specimens										Length 300-410 mm. Table 6									
D	0	0	0	0	0	0	0	0	0	D	0	0	0	0	0	1	0	0	0
2A	0	0	0	2	2	3	1	1	2	2A	0	0	0	2	2	3	1	1	2
2B	0	0	0	1	2	4	1	1	3	2B	0	0	0	2	2	3	1	1	2
V	0	0	0	1	2	2	1	1	1	V	0	0	0	0	0	0	0	0	0
Esox lucius. 2 specimens										Length 95-168 mm. Table 6 Cont.									
D	0	0	0	0	0	0	0	0	0	D	0	0	0	0	0	0	0	0	0
2A	0	0	0	2	2	2	1	1	1	2A	0	0	0	2	2	2	1	1	1
2B	0	0	0	2	2	2	1	1	1	2B	0	0	0	1	2	2	0	1	1
V	0	0	0	0	2	4	0	2	3	V	0	0	0	0	1	2	0	1	1
Ambloplites rupestris. 15 specimens										Length 140-215 mm. Table 7									
D	0	0	0	1	3	6	0	2	5	D	0	16	24	0	2	6	0	1	5
2A	0	6	18	9	12	16	8	11	15	2A	19	36	57	6	11	16	5	10	17
2B	0	24	38	9	12	18	8	11	17	2B	16	42	60	7	11	20	16	10	19
V	0	0	0	5	7	9	4	6	8	V	0	10	18	0	3	7	0	2	6

TABLES 2-7

Eupomotis gibbosus. 15 specimens										Length 100-135 mm. Table 8									
Band 1										Band 3									
Teeth				Radii			Lobes			Teeth				Radii			Lobes		
Location of Scale	Min.	Av.	Max.	Min.	Av.	Max.	Min.	Av.	Max.	Location of Scale	Min.	Av.	Max.	Min.	Av.	Max.	Min.	Av.	Max.
D	0	0	3	0	4	7	0	3	6	D	0	4	18	0	3	7	0	2	6
2A	0	0	0	10	11	14	9	10	13	2A	20	31	45	5	8	11	7	4	10
2B	0	27	45	7	9	11	6	8	11	2B	17	35	56	5	8	11	2	7	10
V	0	23	54	5	7	10	4	5	9	V	0	2	9	0	3	8	0	2	7
Lepomis Pallidus. 7 specimens										Length 45-100 mm. Table 9									
D	0	0	0	3	5	6	2	4	5	D	0	4	12	1	2	4	0	1	3
2A	0	0	0	11	12	15	10	11	14	2A	0	26	41	6	10	13	5	9	12
2B	11	17	20	6	9	10	5	8	9	2B	0	31	49	6	9	12	5	8	11
V	0	6	31	4	6	9	2	5	8	V	0	6	16	1	3	6	0	2	5
Lepomis pallidus. 7 specimens										Length 100-135 mm. Table 9 cont.									
D	0	0	0	3	4	6	1	2	4	D	1	8	17	0	2	5	0	1	4
2A	0	2	7	10	14	16	9	13	14	2A	0	24	56	4	9	10	1	7	9
2B	6	24	53	7	8	10	6	7	9	2B	25	34	55	8	10	15	8	8	14
V	5	13	39	4	5	7	3	4	6	V	0	7	14	0	2	4	0	1	3
Microterus salmoides. 6 specimens										Length 35-62 mm. Table 10									
D	0	0	0	3	4	5	2	3	4	D	0	0	0	0	2	4	0	1	3
2A	0	0	3	4	8	10	3	7	9	2A	0	1	3	4	6	8	3	5	7
2B	3	2	6	5	7	8	4	6	7	2B	0	1	4	5	6	7	4	5	6
V	0	1	3	0	4	6	0	4	5	V	0	0	0	0	3	5	0	2	4
Micropterus salmoides. 6 specimens										Length 55-63 mm. Table 11									
D	0	0	0	1	2	3	0	1	2	D	0	0	0	0	1	3	0	1	2
2A	0	0	0	6	7	8	5	6	7	2A	0	3	5	6	6	7	5	6	7
2B	0	0	0	7	7	8	6	6	7	2B	0	4	9	5	6	7	4	5	6
V	0	0	0	2	2	2	1	1	1	V	0	0	0	0	1	2	0	1	1
Micropterus dolomieu. 3 specimens										Length 305 mm. Table 11 cont.									
D	0	0	0	2	2	2	1	1	1	D	0	0	0	0	0	0	0	0	0
2A	0	0	0	8	8	8	7	7	7	2A	13	13	13	9	9	9	8	8	8
2B	0	0	0	5	5	5	5	5	5	2B	30	30	30	6	6	6	5	5	5
V	0	0	0	3	3	3	2	2	2	V	0	0	0	0	0	0	0	0	0

TABLES 8-11